

REMARKS

Upon entry of this Amendment, claims 1-3, 7-10, 12-17, 19-23, 25-26, 28-30, 32-35, 37-39, 42-45, 48-52, 54-60, 62, 64, 68-69, 71-76, and 78-91 will be pending, of which claims 1, 2, 3, 26, 39, 60, and 80 are independent. The claims have been amended, and new claims 84-91 have been added, to further specify Applicants' invention. Support for the amendments and new claims can be found throughout the application as filed and it is, accordingly, respectfully submitted that no new matter has been added. Reconsideration of the outstanding rejections and objections is respectfully requested in view of the above amendments and the following remarks.

Preliminarily, Applicants acknowledge the Examiner's remarks in paragraph 2 of the outstanding Office Action and intend to submit the original patent, or an affidavit/declaration as to the loss thereof, in due course.

With respect to the Examiner's comments regarding the written consent of the assignee to the filing of the Reissue application (paragraph 4 of the outstanding Office Action), Applicants note that such a written consent is being filed contemporaneously herewith.

Rejections under 35 U.S.C. §102 and/or 35 U.S.C. §103

Preliminarily, Applicants note that no art was cited against independent claims 1 and 2.

Regarding independent claim 3, Applicants note that this claim has been amended to incorporate the subject matter of claims 4-6, which were consequently cancelled. Claims 3-6 stand rejected over the prior art under 35 U.S.C. §102 and/or 35 U.S.C. §103. Applicants note, however, that none of the prior art rejections presented by the Examiner rejects all claims 3-6. For instance, claims 3-5 stand rejected over EP 0,360,869 to Ohkawa *et al.*, but claim 6 does not stand rejected over this reference. *See* paragraph 39 of the outstanding Office Action. Similarly, claims 3 and 5-6 stand, for instance, rejected over U.S. Patent 4,656,090 to Markovitz, but claim 4 does not stand rejected over this reference. *See* paragraph 27 of the outstanding Office Action. Accordingly, Applicants respectfully submit that claim 3, as amended, is clearly distinguished over the art herein of record, and

withdrawal of all the rejections of claim 3 under 35 U.S.C. §102 and 35 U.S.C. §103 is respectfully requested.

Regarding independent claim 26, Applicants note that this claim has been amended to incorporate the subject matter of claim 31, which was consequently cancelled. Applicants further note that no art was cited against claim 31. Accordingly, Applicants respectfully submit that instant independent claim 26 is clearly distinguished over the art herein of record, and withdrawal of all the rejections of claim 26 under 35 U.S.C. §102 and 35 U.S.C. §103 is respectfully requested.

Regarding independent claim 39, Applicants note that this claim has been amended to incorporate the subject matter of claims 46 and 47, which were consequently cancelled. Applicants further note that no art was cited against claims 46 and 47. Accordingly, Applicants respectfully submit that instant independent claim 39 is clearly distinguished over the art herein of record, and withdrawal of all the rejections of claim 39 under 35 U.S.C. §102 and 35 U.S.C. §103 is respectfully requested.

Regarding independent claim 60, Applicants note that this claim has been amended to incorporate the subject matter of claim 77. Applicants further note that no art was cited against claim 77. Accordingly, Applicants respectfully submit that instant independent claim 60 is clearly distinguished over the art herein of record, and withdrawal of all the rejections of claim 60 under 35 U.S.C. §102 and 35 U.S.C. §103 is respectfully requested.

Independent claim 80 stands rejected under 35 U.S.C. §102 as anticipated by or, in the alternative, under 35 U.S.C. §103 as obvious over EP 0,360,869 to Ohkawa *et al.* In paragraph 38 of the outstanding Office Action, the Examiner acknowledges that "Ohkawa *et al.* does not disclose the composition of claim 80". Applicants concur with this acknowledgement and, accordingly, respectfully request withdrawal of all the rejections of claim 80 under 35 U.S.C. §102 and 35 U.S.C. §103.

For at least the reasons presented above, Applicants respectfully submit that instant independent claims 1-3, 26, 39, 60, and 80 are patentable over the art herein of record. Accordingly, it is further submitted that all claims dependent thereon, *i.e.* all remaining

pending claims, are also distinguished over the art herein of record. Consequently, withdrawal of all the rejections under 35 U.S.C. §102 and 35 U.S.C. §103 set forth in the outstanding Office Action is respectfully requested.

Rejections under 35 U.S.C. §112, first paragraph, and/or 35 U.S.C. §251

- re: Paragraphs 7-9, 11-12, 14-15, 17-18, and 22 of the outstanding Office Action.

Applicants have reviewed and revised the claims bearing in mind the Examiner's concerns expressed in paragraphs 7-9, 11-12, 14-15, 17-18, and 22 of the outstanding Office Action regarding 35 U.S.C. §112, first paragraph, and 35 U.S.C. §251. Withdrawal of the rejections set forth in these paragraphs is respectfully requested in view of the claim revisions.

- re: Paragraphs 10, 13, and 16 of the outstanding Office Action.

Regarding the rejection of claims 10, 24, and 36 under 35 U.S.C. §112, first paragraph, and under 35 U.S.C. §251, Applicants note that these claims have been cancelled. Accordingly, it is respectfully submitted that these rejections are moot.

- re: Paragraph 19 of the outstanding Office Action.

Claim 83 stands rejected under 35 U.S.C. §112, first paragraph, and under 35 U.S.C. §251. Applicants note that the dependency of claim 83 has been changed from claim 80 to claim 81, and it is respectfully submitted that claim 83, as amended, is in full compliance 35 U.S.C. §112, first paragraph, and 35 U.S.C. §251.

- re: Paragraph 20 of the outstanding Office Action.

Claims 18 and 54 stand rejected under 35 U.S.C. §112, first paragraph, and under 35 U.S.C. §251. Applicants thank the Examiner for pointing out the clerical error regarding the weight ratio of cationically polymerizable components to radically polymerizable components. The claims have been amended pursuant to the Examiner's remarks, with the note that claim 18 has been cancelled and that the revision has instead been made to claim 17 (and claim 54).

- re: Paragraph 41 of the outstanding Office Action.

Claims 3-38 stand rejected under 35 U.S.C. §251. The Examiner contends that "[i]nstant claims 3-38 are all of the same or broader scope than the claims given up when applicants added water as an essential component in Paper No. 6 of parent application 08-476,482". *See* paragraph 41 of the outstanding Office Action. Applicants disagree with the Examiner's contention but, in order to expedite prosecution, have revised independent claims 3 and 26, *i.e.* the only independent claims within the rejected claims 3-38, to include water as part of the claimed compositions. Accordingly, withdrawal of the 35 U.S.C. §251 rejection is respectfully requested.

Rejections under 35 U.S.C. §112, second paragraph

- re: Paragraph 21 of the outstanding Office Action.

Claims 1-2 stand rejected under 35 U.S.C. §112, second paragraph. Applicants have revised the claim language to further clarify the antecedent basis for each of the recited epoxy resins. It is respectfully submitted that claims 1-2, as amended, are in full compliance with 35 U.S.C. §112, second paragraph.

- re: Paragraph 28 of the outstanding Office Action.

Claims 18, 30, 54, 71, and 80-83 stand rejected under 35 U.S.C. §112, second paragraph. Applicants have reviewed and revised the claims bearing in mind the Examiner's concerns and withdrawal of the rejections set forth in paragraph 28 of the outstanding Office Action is respectfully requested in view of these revisions.

- re: Paragraph 29 of the outstanding Office Action.

Claims 10-18, 20, 24, 26-38, 46-54, 56, 63-71, 73, and 80-83 stand rejected under 35 U.S.C. §112, second paragraph.

Specifically, the Examiner has rejected claims 10-18, 26-38, 46-54, 56, 63-71, and 80-83 by contending that the terms "mono-functional acrylate" and "trifunctional acrylate" are indefinite. *See* paragraph 29 of the outstanding Office Action. Applicants disagree with the Examiner's contention, and respectfully submit that these terms are adequately described in

the specification. *See*, for instance, page 4, lines 36-39, of the specification. Nevertheless, in order to expedite prosecution, Applicants have substituted these terms with "mono-acrylate monomer" and "tri-acrylate monomer".

Applicants similarly disagree with the Examiner's contention that it is unclear what is meant with the functionality of the of the epoxy novolac resin in claims 20, 32, 56, and 73, and respectfully submit that one of ordinary skill in the art would understand "functionality" to refer to the average number of epoxy groups being present in the epoxy novolac molecules of the resin. However, in order to expedite prosecution, Applicants have revised the claim language pursuant to the Examiner's concerns.

With respect to the Examiner's concerns regarding claims 24 and 36, Applicants note that these claims have been cancelled and respectfully submit that the rejection of these claims is moot.

Withdrawal of all rejections set forth in paragraph 29 of the outstanding Office Action is respectfully requested.

- re: Paragraphs 30-31 of the outstanding Office Action.

Applicants have reviewed and revised the claims bearing in mind the Examiner's concerns and withdrawal of the rejections set forth in paragraphs 30 and 31 of the outstanding Office Action is respectfully requested in view of these revisions.

Rejections under 35 U.S.C. §101

Claim 81 stands rejected under 35 U.S.C. §101. *See* paragraph 23 of the outstanding Office Action. Applicants have reviewed and revised claim 81 bearing in mind the Examiner's concerns and withdrawal of the rejection is respectfully requested.

For any and all of the above reasons, it is respectfully submitted that the present invention is patentable.

CONCLUSION

Since all objections and rejections have been addressed and overcome, it is respectfully submitted that the instant Application is in condition for allowance and a Notice to that effect is earnestly solicited. If, after reviewing the above, the Examiner believes any issues remain unresolved, the Examiner is encouraged to contact the undersigned by telephone to expedite the prosecution of this application.

Respectfully submitted,
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Enclosure: Appendix

APPENDIX
VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 4-6, 11, 18, 24, 27, 31, 36, 40, 46-47, 53, 61, 63, 65-67, 70, and 77 have been cancelled.

Claims 84-91 have been added.

Claims 1-3, 7-10, 12-17, 19-23, 25-26, 28-30, 32, 34-35, 37-39, 41-45, 48-52, 54-60, 62, 64, 68-69, 71, 73, 80-81, and 83 have been amended as follows:

1. In an improved photohardenable composition composed of a cationically polymerizable and free radical polymerizable organic substance, a photo-generated acid precursor, a sensitizer for the photo-generated acid precursor and a free radical polymerization initiator wherein the improvement comprises:

a) a mixture of photopolymerizable resins consisting essentially of

at least two epoxy resins, said at least two epoxy resins including a first epoxy resin polymerizing [one of which polymerizes] at a slower rate and [has] having a higher neat viscosity than at least one other epoxy resin present, [and] said [one of which] first epoxy resin [is] being present at a concentration in the mixture of from 5 to 25% by weight, and

at least one monoacrylic monomer and at least one multi-acrylic monomer wherein the concentration of the monoacrylic monomer is from 0.12 to 0.90 parts by weight that of the multiacrylic monomer and wherein the ratio of the weight of the epoxy resins to that of the acrylic monomers is between 3 to 10; and

b) a combination of a free radical initiator and a photo-generating acid precursor characterized by optical molar extinction coefficients and optimized for use with a multi-wavelength argon ion laser operating in the UV and producing two major wavelengths of 351 nm and 364 nm such that a normalized ratio of the extinction coefficients of the precursor and the initiator at one major wavelength is less than 3 times the ratio of extinction coefficient at a second major wavelength.

2. A method for accurately fabricating an integral three dimensional article having improved green strength by controlling the diffusion of photoactivated molecular species in the regions of a photohardenable liquid composition exposed to actinic radiation, the method comprising the steps of:

- (a) forming a layer of the photohardenable liquid composition;
- (b) imagewise exposing areas of at least a portion of the layers to actinic radiation at wavelengths of 351 nm and 364 nm;
- (c) introducing a new layer of liquid on to the layer previously exposed imagewise in step (b);
- (d) imagewise exposing at least a portion of the new liquid layer to actinic radiation, wherein the improvement comprises use of photohardenable liquid composition comprising:
 - a) a mixture of photopolymerizable resins consisting essentially of
 - at least two epoxy resins, said at least two epoxy resins including a first epoxy resin polymerizing [one of which polymerizes] at a slower rate and [has] having a higher neat viscosity than at least one other epoxy resin present, [and] said [one of which] first epoxy resin [is] being present at a concentration in the mixture of from 5 to 25% by weight, and
 - at least one monoacrylic monomer and at least one multi-acrylic monomer wherein the concentration of the monoacrylic monomer is from 0.12 to 0.90 parts by weight that of the multiacrylic monomer and wherein the ratio of the weight of the epoxy resins to that of the acrylic monomers is between 3 to 10; and
 - b) a combination of a free radical initiator and a photo-generating acid precursor characterized by optical molar extinction coefficients and optimized for use with a multi-wavelength argon ion laser operating in the UV and producing two major wavelengths of 351 nm and 364 nm such that a normalized ratio of the extinction coefficients of the precursor and the initiator at one major wavelength is less than 3 times the ratio of extinction coefficient at a second major wavelength.

3. A photohardenable composition comprising:

- (i) a mixture of cationically polymerizable components having at least two epoxy resins, said at least two epoxy resins including a first epoxy resin polymerizing at a slower rate and having a higher neat viscosity than at least one other epoxy resin present,

- [a) at least one low-viscosity, fast-curing cationically polymerizable component, and
- b) at least one high-viscosity, slow-curing curing cationically polymerizable component; and]

- (ii) [at least one] a blend of radically polymerizable components;
- (iii) at least one photo-generating acid precursor;
- (iv) at least one free radical initiator; and
- (v) water;

wherein said high-viscosity, slow-curing cationically polymerizable component has a viscosity of greater than 1000 poise @ 25°C and a viscosity of greater than 200 poise @ 52°C.

7. The composition of claim 5 wherein said **[high-viscosity, slow-curing cationically polymerizable component]** first epoxy resin has a softening point below 40°C.

8. The composition of claim 3 wherein said mixture of cationically polymerizable components comprises, relative to the total weight of said at least two epoxy resins, from 5 to 25% by weight of said **[high-viscosity, slow-curing cationically polymerizable component]** first epoxy resin.

9. The composition of claim 8 wherein said **[high-viscosity, slow-curing cationically polymerizable component]** first epoxy resin has a viscosity of greater than 1000 poise @ 25°C.

10. The composition of claim 3 wherein said **[at least one radically polymerizable component]** blend includes at least one mono-**[functional]** acrylate monomer and at least one multi-acrylate monomer.

12. The composition of claim [11] 10 wherein the total amount of mono-**[functional]** acrylate monomers to the total amount of multi-**[functional]** acrylate monomers present in the composition, on a parts by weight basis **[relative to the total**

composition] , is **[0.12 to 0.9]** 0.12-0.9 parts of mono-acrylate monomers to 1 part of multi-acrylate monomers.

13. The composition of claim **[11]** 10 wherein the total amount of mono-**[functional]** acrylate monomers to the total amount of multi-**[functional]** acrylate monomers present in the composition, on a parts by weight basis **[relative to the total composition]** , is **[0.27 to 0.58]** 0.27-0.58 parts of mono-acrylate monomers to 1 part of multi-acrylate monomers.

14. The composition of claim **[11]** 10 wherein said at least one **[radically polymerizable component further]** multi-acrylate monomer includes at least one tri-**[functional]** acrylate monomer.

15. The composition of claim 14 wherein the total amount of mono-**[functional]** acrylate monomers to the total amount of tri-**[functional]** acrylate monomers present in the composition, on a parts by weight basis **[relative to the total composition]**, is **[0.12 to 0.9]** 0.12-0.9 parts of mono-acrylate monomers to 1 part of tri-acrylate monomers.

16. The composition of claim 14 wherein the total amount of mono-**[functional]** acrylate monomers to the total amount of tri-**[functional]** acrylate monomers present in the composition, on a parts by weight basis **[relative to the total composition]**, is **[0.27 to 0.58]** 0.27-0.58 parts of mono-acrylate monomers to 1 part of tri-acrylate monomers.

17. The composition of claim 3 **[wherein said at least one radically polymerizable component further includes a blend of radically polymerizable monomers comprising said at least one mono-functional acrylate monomer and at least one multi-functional acrylate monomer]** , wherein the ratio, on a parts by weight basis, of **[said blend of radically polymerizable monomers to]** said mixture of cationically polymerizable components to said blend of radically polymerizable components is from **[3 to 10]** 3-10 parts of said mixture to 1 part of said blend.

19. The composition of claim 3 wherein said **[high viscosity, slow-curing cationically polymerizable component]** first epoxy resin includes an epoxy phenolic novolac resin and/or an epoxy cresol novolac resin.
20. The composition of claim 19 wherein said epoxy phenolic novolac resin has **[a functionality of]** on average 3.6 or more epoxy groups.
21. The composition of claim 3 wherein said **[low-viscosity, fast-curing cationically polymerizable component]** at least one other epoxy resin includes at least one cycloaliphatic epoxy.
22. The composition of claim **[4]** 3 wherein said composition further comprises a sensitizer for the photo-generated acid precursor.
23. The composition of claim 3 wherein said **[at least one]** blend of radically polymerizable components includes tetrahydrofurfuryl acrylate, isobornyl acrylate, lauryl acrylate and/or caprolactone acrylate.
25. The composition of claim 3 wherein said **[at least one]** blend of radically polymerizable components includes caprolactone acrylate.
26. A photohardenable composition comprising:
 - a mixture of **[cationically polymerizable resins consisting essentially of]** at least two epoxy resins wherein a first epoxy resin polymerizes at a slower rate and has a higher neat viscosity than a second epoxy resin,
 - at least one mono-**[functional]** acrylate monomer and at least one multi-acrylate monomer,
 - a photo-generated acid precursor, **[and]**
 - a free radical polymerization initiator, and
 - water;
 - wherein said first epoxy resin comprises an epoxy phenolic novolac resin and/or an epoxy cresol novolac resin.

28. The photohardenable composition of claim [27] 26 wherein the total amount of mono-[**functional**] acrylate monomers to the total multi-[**functional**] acrylate monomers present in the composition, on a parts by weight basis [**relative to the total composition**] , is [0.12 to 0.9] 0.12-0.9 parts of mono-acrylate monomers to 1 part of multi-acrylate monomers.

29. The photohardenable composition of claim [27] 26 wherein the total amount of mono-[**functional**] acrylate monomers to the total amount of multi-[**functional**] acrylate monomers present in the composition, on a parts by weight basis [**relative to the total composition**] , is [0.27 to 0.58] 0.27-0.58 parts of mono-acrylate monomers to 1 part of multi-acrylate monomers.

30. The photohardenable composition of claim [27] 26 wherein the ratio, on a parts by weight basis, of said mixture [**of cationically polymerizable resins**] to said mono-[**functional**] acrylate and multi-[**functional**] acrylate monomers is from [3 to 10] 3-10 parts of said mixture to 1 part of said mono-acrylate and multi-acrylate monomers.

32. The photohardenable composition of claim [31] 26 wherein said epoxy phenolic novolac resin has [**a functionality of**] on average 3.6 or more epoxy groups.

34. The photohardenable composition of claim 26 wherein said composition [**further**] comprises a tri-[**functional**] acrylate monomer.

35. The photohardenable composition of claim 26 wherein said at least one mono-[**functional**] acrylate monomer includes tetrahydrofurfuryl acrylate, isobornyl acrylate, lauryl acrylate and/or caprolactone acrylate.

37. The photohardenable composition of claim 26 wherein said at least one mono-[**functional**] acrylate monomer includes caprolactone acrylate.

39. A method for fabricating a three-dimensional article comprising:
a. forming a layer of a photohardenable composition comprising,

- (1) a mixture of cationically polymerizable components having at least two epoxy resins, said at least two epoxy resins including a first epoxy resin polymerizing at a slower rate and having a higher neat viscosity than at least one other epoxy resin present,
 - (a) at least one low-viscosity, fast-curing cationically polymerizable component, and**
 - b) at least one high-viscosity, slow-curing curing cationically polymerizable component; and]**
 - (2) a blend of at least one mono-acrylate monomer and at least one multi-acrylate monomer **[radically polymerizable component] ;**
 - (3) at least one photo-generating acid precursor; and
 - (4) at least one free radical initiator;
 - b. imagewise exposing areas of at least a portion of the layer to actinic radiation; and
 - c. introducing a new layer of said composition on to the layer previously exposed imagewise in step (b) and repeating step (b).
41. The method of claim 39 wherein said **[high-viscosity, slow-curing cationically polymerizable component]** first epoxy resin has a viscosity of greater than 1000 poise @ 25°C.
42. The method of claim 39 wherein said **[high-viscosity, slow-curing cationically polymerizable component]** first epoxy resin has a viscosity of greater than 200 poise @ 52°C.
43. The method of claim **[41]** 39 wherein said **[high-viscosity, slow-curing cationically polymerizable component]** first epoxy resin has a softening point below 40°C.
44. The method of claim 39 wherein said mixture of cationically polymerizable components comprises, relative to the total weight of said at least two epoxy resins,

from 5 to 25% by weight of said **[high-viscosity, slow-curing cationically polymerizable component]** first epoxy resin.

45. The method of claim 44 wherein said **[high-viscosity, slow-curing cationically polymerizable component]** first epoxy resin has a viscosity of greater than 1000 poise @ 25°C.

48. The method of claim [47] 39 wherein the total amount of mono-**[functional]** acrylate monomers to the total amount of multi-**[functional]** acrylate monomers present in the composition, on a parts by weight basis **[relative to the total composition]** , is **[0.12 to 0.9]** 0.12-0.9 parts of mono-acrylate monomers to 1 part of multi-acrylate monomers.

49. The method of claim [47] 39 wherein the total amount of mono-**[functional]** acrylate monomers to the total amount of multi-**[functional]** acrylate monomers present in the composition, on a parts by weight basis **[relative to the total composition]** , is **[0.27 to 0.58]** 0.27-0.58 parts of mono-acrylate monomers to 1 part of multi-acrylate monomers.

50. The method of claim [46] 39 wherein said blend **[at least one radically polymerizable component further]** includes at least one tri-**[functional]** acrylate monomer.

51. The method of claim 50 wherein the total amount of mono-**[functional]** acrylate monomers to the total amount of tri-**[functional]** acrylate monomers present in the composition, on a parts by weight basis **[relative to the total composition]** , is **[0.12 to 0.9]** 0.12-0.9 parts of mono-acrylate monomers to 1 part of tri-acrylate monomers.

52. The method of claim 50 wherein the total amount of mono-**[functional]** acrylate monomers to the total amount of tri-**[functional]** acrylate monomers present in the composition, on a parts by weight basis **[relative to the total composition]** , is

[0.27 to 0.58] 0.27-0.58 parts of mono-acrylate monomers to 1 part of tri-acrylate monomers.

54. The method of claim **[53]** 39 wherein the ratio, on a parts by weight basis, of **[said blend of radically polymerizable monomers to]** said mixture of cationically polymerizable components to said blend is from **[3 to 10]** 3-10 parts of said mixture to 1 part of said blend.

55. The method of claim 39 wherein said **[high viscosity, slow-curing cationically polymerizable component]** first epoxy resin includes an epoxy phenolic novolac resin and/or an epoxy cresol novolac resin.

56. The method of claim 55 wherein said epoxy phenolic novolac resin has **[a functionality of]** on average 3.6 or more epoxy groups.

57. The method of claim 39 wherein said **[low-viscosity, fast-curing cationically polymerizable component]** at least one other epoxy resin includes at least one cycloaliphatic epoxy.

58. The method of claim 55 wherein said **[low-viscosity, fast-curing cationically polymerizable component]** at least one other epoxy resin includes at least one cycloaliphatic epoxy.

59. The method of claim **[40]** 39 wherein said composition further comprises a sensitizer for the photo-generated acid precursor.

60. A method of forming a photohardenable composition comprising:

- a. forming a mixture of epoxy resins having a first epoxy resin which polymerizes at a slower rate and has a higher neat viscosity than a second epoxy resin, said first epoxy resin having a softening point below 40°C, [and]

- c. mixing in **[a free radical polymerizable substance]** at least one monoacrylic monomer and [a] at least one multiacrylic monomer, and
- c. adding a photo-generated acid precursor and a free radical polymerization.

62. The method of claim **[61]** 60 further comprising admixing a sensitizer for the photo-generated acid precursor.

64. The method of claim 60 wherein said **[free radical polymerizable substance]** at least one multi-acrylate monomer includes a tri-**[functional]** acrylate monomer.

68. The method of claim **[66]** 60 wherein the total amount of mono-**[functional]** acrylate monomers to the total amount of multi-**[functional]** acrylate monomers present in the composition, on a parts by weight basis **[relative to the total composition]** , is **[0.12 to 0.90]** 0.12-0.90 parts of mono-acrylate monomers to 1 part of multi-acrylate monomers.

69. The method of claim **[66]** 60 wherein the total amount of mono-**[functional]** acrylate monomers to the total amount of multi-**[functional]** acrylate monomers present in the composition, on a parts by weight basis **[relative to the total composition]** , is **[0.27 to 0.58]** 0.27-0.58 parts of mono-acrylate monomers to 1 part of multi-acrylate monomers.

71. The method of claim **[70]** 60 wherein the ratio, on a parts by weight basis, of said mixture of epoxy resins to said **[free radical polymerizable substance]** at least one mono-acrylate monomer and said multi-acrylate monomer is from **[3 to 10]** 3-10 parts of said mixture to 1 part of said mono-acrylate and multi-acrylate monomer.

73. The method of claim 72 wherein said epoxy phenolic novolac resin has **[a functionality of]** on average 3.6 or more epoxy groups.



80. A photohardenable composition comprising:

(a) a mixture of at least two epoxy resins, said at least two epoxy resins including a first epoxy resin polymerizing at a slower rate and having a higher neat viscosity than at least one other epoxy resin present, said first epoxy resin being present, relative to the total weight of said mixture, in an amount of from 5 to 25% by weight, [relative to the total mixture, of at least one high-viscosity, slow-curing epoxy, wherein said high-viscosity, slow-curing [cationically polymerizable component has] said first epoxy resin having a viscosity of greater than 1000 poise @ 25°C and a softening point below 40°C, [and at least one low-viscosity, fast-curing epoxy,]

(b) a blend of acrylate functional monomers comprising at least one multi-[**functional**] acrylate monomer and at least one mono-[**functional**] acrylate monomer, wherein the ratio of said at least one mono-[**functional**] acrylate monomer to said at least one multi-[**functional**] acrylate monomer, on a parts by weight basis [**relative to the total composition**] , is [**0.12 to 0.90**] 0.12-0.90 parts of mono-acrylate monomers to 1 part of multi-acrylate monomers,

(c) at least one photo-generating acid precursor, and

(d) at least one free radical initiator,

wherein the ratio, on a parts by weight basis, of said [**blend**] mixture of epoxy resins [**and**] to said blend of [functional] acrylate functional monomers is from [**3 to 10**] 3-10 parts of said mixture to 1 part of said blend.

81. A method of forming a three-dimensional article comprising:

- a. [**processing**] forming a layer of the composition of claim 80 [to form a solid image] ;
- b. imagewise exposing areas of at least a portion of the layer to actinic radiation; and
- c. introducing a new layer of said composition on to the layer previously exposed imagewise in step (b) and repeating step (b).

83. An article formed [**from the composition of claim 80**] with the process of claim 81.